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The Governance Landscape of Geospatial E-Services—The Belgian Case

Maxim Chantillon [1,*], Joep Crompvoets [1] and Vassilios Peristeras [2]

[1] KU Leuven Public Governance Institute, 3000 Leuven, Belgium; joep.crompvoets@kuleuven.be
[2] School for Science and Technology, International Hellenic University, 57001 Thermi, Greece; v.peristeras@ihu.edu.gr
* Correspondence: maxim.chantillon@kuleuven.be; Tel.: +32-496-352-453

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Abstract: Geospatial data and geospatial e-services require governance and coordination between different governmental organisations. This article aims to understand what governance, and specifically what coordination, is used in Belgium for geospatial e-services and data. The Belgian case, with a focus on the regions and federal administration, is researched by making use of a document analysis, interviews with key stakeholders and an online survey. In contrast to the federal and Walloon administration, the Flemish administration and the Brussels Capital Region administration have a clearly developed governance model. Flanders combines hierarchy with network governance, whereas the Brussels administration is known for its hierarchical way of working. The transposition of the INSPIRE Directive had a strong influence: The Brussels Capital Region became more network-oriented, and the Walloon Region developed a form of network governance. The federal level, however, struggles to make the connection between geospatial data and e-services. From an inter-organisational perspective, the coordination can be labelled as a weak form of network governance: Cooperation exists, but only in a few areas. Nevertheless, geospatial data are exchanged within and between regions and the federal level. Geospatial e-services are also developed but there is a clear influence of the degree of organisational coordination on the development of geospatial e-services.

Keywords: e-services; geospatial data; governance; coordination; Belgium

1. Introduction

1.1. Objective and Research Questions

Geospatial data have high value for administrations, citizens and businesses. They have high potential for actors in various domains, and administrations often own a lot of data, sometimes without even realizing it [1]. Governments and administrations are today increasingly aware of the possibilities offered by technology and develop e-services for their internal relations and their relations with citizens and businesses. Those administrations often build on existing ways of working, and combine or build on existing technology. Affisco and Soliman [2], however, underlined that it is necessary to connect all the different e-services that have been developed since the beginning of the 21st century. Latre et al. [3] argue that 'the level of maturity or sophistication of e-government services is not improving in those areas that require geospatial information'. Furthermore, the authors underline that, although geospatial data are more and more available, 'their use and management is still more complex [...] when compared to other kinds of data'. So, the focus of this article is on geospatial data and e-services, as the data are highly valuable and necessary for the development of geospatial e-services.

In line with Affisco and Soliman [2], who argue that the islands of e-services need to be connected, the aim of the article is to understand what governance, and specifically what type of coordination, is used in the sector of geospatial data and e-services. Coordination is central as e-services have until now often been developed on an individual basis by organisations. In addition, the European Interoperability Framework highlights the importance of coordination: It underlines that organisational relations need to be clarified and formalised in order to develop and maintain e-services [4].

A number of specific research questions have been formulated on the basis of the research aim. A first research question is: "Who are the leading public sector actors with regards to geospatial e-services?" Based on this question, and bearing in mind that geospatial data are necessary for geospatial e-services, a second research question was formulated: "Who are the users and producers of geospatial data, and what is the source of origin of their data?" Thirdly, the coordination between the leading public sector actors will be analysed: "What types of coordination mechanisms are used in the field of geospatial data and e-services?" Finally, the fourth research question, "how can the current governance structures be explained?" aims to provide an explanation of the current situation concerning geospatial governance.

The Belgian administration has been selected as a case study. From a governance perspective, it is a highly interesting country to study as it has a dual federal structure whereby the creation of the federal structure was mainly the result of the unwillingness of two language groups (Dutch-speaking and French-speaking) to cooperate. The creation of a federal structure, however, reinforces this unwillingness, leading to a dual federal state. This makes the Belgian case interesting to study: A dual federal state needs to cooperate via instruments that focus on loyalty and coherence; however, this seems to be lacking [5].

The Belgian state has a federal structure. It is composed of a Federal State, three regions and three language communities. The three regions (Brussels Capital Region, Flemish Region and Walloon Region) are responsible for territorial policy areas such as urban development and environmental policy. Furthermore, there are three language communities (Flemish Community, French Community and German-speaking Community). The language communities are responsible for personal matters. So the regions are especially important from a geospatial perspective. Besides the Federal State, the regions and the language communities, there are also 10 provinces and 589 communities [6]. This article will, however, focus on the highest state structure that is mostly linked to geospatial e-services and data, namely the administrations of the Federal State and the three regions. Studying the language communities, the provinces and communities do not fall within the scope of this article.

The article starts with a theoretical overview of the three main concepts, e-services, geospatial data and governance. The methodology that was used to find an answer to the four research questions is explained. Thereafter the results are presented, answering the first three research questions. In the discussion the current governance status is analysed and explained, answering the fourth research question. Finally, some conclusions are drawn and further research in governance structures for e-services outlined.

1.2. Theoretical Overview: E-Services, Geospatial Data and Governance

1.2.1. E-Services

Tiwana and Ramesh [7] are among the first to define e-services and state that those are "[. . .] Internet-based applications that fulfil service needs by seamlessly bringing together distributed, specialised resources to enable complex, (often real-time) transactions. Examples of e-services include supply chain management, customer relationship management, accounting, order processing, resource management, and other services that are electronically delivered through the Internet". The focus of their article lies, however, in software as a service. Scupola [8] defines e-services "as services that are produced, provided and/or consumed through the use of ICT-networks such as internet-based systems and mobile solutions". Another definition is provided by Lovelock and Wirzt [9]: An e-service is "an act or performance that creates value and provides benefits for customers through a process

that is stored as an algorithm and typically implemented by networked software" [9,10]. Whereas the first two definitions can be used for both public and private perspectives on e-services, the perspective of Lovelock and Wirzt [9] is focused more on the private sector, with the reference to 'customers'. Furthermore, their definition also defines an e-service more from a technical perspective by making a reference to 'an algorithm' and 'networked software'. The main weakness of the Tiwana and Ramesh [7] definition is that it is written from a 'software as a service'-perspective, whereas the definition of Scupola [8] is more focused on the non-technical side of e-services. The Scupola [8] definition is more connected to governance, which is the focus of this research. Therefore, this definition has been chosen.

An important part of the academic discussion on the meaning of e-services is the distinction between public and private e-services. In the early days of defining e-services, a governmental perspective on e-services was lacking: This can partially be attributed to the fact that the 'e-service innovation' was launched in 2000 by Hewlett-Packard, a private sector actor [11]. Later, more specific attention was developed for the e-services developed in a governmental context [12,13].

Finally, the emergence of e-services has led to the disappearance of the division between goods and services. Goods that used to be sold to customers are, via digitalisation, converted into services [13,14]. A striking example of this convergence in the geospatial context is maps. As a result of the European Union INSPIRE Directive and the Directive on the re-use of public sector information [15–17], governmental agencies previously selling maps, as goods, are now increasingly offering the information via digital channels as a service, and no longer as a good. This can have an effect on governmental organisations, which are partially self-sustaining via the selling of goods such as maps, as they might have to review their business model.

1.2.2. Geospatial Data

Besides e-services, there is also the connection with geospatial data. The Oxford Dictionary does not define geospatial data, but spatial data are defined as "facts and statistics used for reference or analysis, relating to space" [18]. The INSPIRE Directive takes a very similar position and defines spatial data as "data with a direct or indirect reference to a specific location or geographic area" [15]. Finally, Masser and Crompvoets [19] state that "geographic information identifies or describes locations on the surface of the earth". Although the authors do not define geospatial data, the link between both is clear: Information is giving meaning to the data itself.

Public authorities are the main users and producers of geospatial data. It is essential that the data quality can be trusted and has a controlled source of origin, as many policies are making use of this type of data [3]. More and more, however, there are different stakeholders with a clear interest in this geospatial data. Geospatial data are no longer the sole territory of specialised mapping agencies and experts, but a tool that is becoming indispensable for modern governance. To ensure that various stakeholders have access to the data and see the added value of geospatial data, there has to be a creation of geospatial e-services and accompanying structures and processe, to govern the sharing of this geospatial data [20,21]. Furthermore, the data can be used to improve existing e-services with a geospatial component. Latre et al. [3] underline, however, that geospatial data are often 'difficult to create, maintain and exploit, it is expensive, and presents scale, resolution, thematic and jurisdictional problems when used'. Therefore, one of the critical points in developing geospatial e-services is the existence of governance structures with established lines of coordination.

1.2.3. Governance

Coordination "implies the bringing into a relationship [of] otherwise disparate activities or events". The question arises in what way coordination can be achieved [22]. Bouckaert et al. [23] brought together three theoretical approached of coordination: Markets, Hierarchies and Networks, based on (see Table 1):

- **Hierarchy-type mechanism:** This type of mechanism is based on the idea that authority and power are the fundamental processes and resources. There can be bureaucratic hierarchical control: 'public organisations remain basic bureaucracies that are controlled by rules and internal authority', and political hierarchical control, public-sector organisations and their behaviour are ultimately controlled by political leaders'. This mechanism can work via a broad range of possible tools, ranging from legislation to procedural control mechanisms.
- **Market-type mechanism:** Using the markets as a coordination mechanism is based on the idea that bargaining is the basic process and resource. In markets buyers and sellers come together and bargain until they find a common agreement—in this way a balance is found between supply and demand. However, to establish well-functioning markets to supply governmental services, there is a need for a central authority that can ensure that the outcomes desired by the government are achieved.
- **Network-type mechanism:** Networks are considered to be '(more or less) stable patterns of cooperative interaction between mutually dependent actors around specific issues of policy (or management)'. So, between organisations there is cooperation based on voluntary collaborative actions as well as solidarity between organisations. There is bargaining, negotiation and co-operation between the participating organisations, based on trust, a certain level of information-sharing and time.

This remains, however, a theoretical perspective. In reality, there will always be a balance between the different mechanisms as 'administrative reforms represent a mixed order' [24].

Table 1. The features of hierarchies, markets and networks.

	Hierarchy	Market	Network
Base of interaction	Authority and dominance	Exchange and competition	Cooperation and solidarity
Purpose	Consciously designed and controlled design	Spontaneously created results	Consciously designed purposes or spontaneously created results
Guidance, control and evaluation	Top-down norms and standards, routines, supervision, inspection, intervention	Supply and demand, price mechanism, self-interest, profit and losses as evaluation, courts, invisible hand	Shared values, common problem analysis, consensus, loyalty, reciprocity, trust, information evaluation—reputation
Role of government	Top-down rule-maker and steerer; dependent actors are controlled by rules	Creator and guardian of markets, purchaser of goods; actors are independent	Network enabler, network manager and network participant
Resources needed	Authority, power	Bargaining, information, power	Mutual co-optation, trust
Theoretical basis	Weberian bureaucracy	Neo-institutional economics	Network theory

Source: Bouckaert et al. [23].

2. Materials and Methods

A pragmatic approach, combining the three methods, was chosen to provide an answer to the four research questions. A first approach was a review of documents, mainly legal texts, that structure the relations between organisations, as well as the intergovernmental relations between the three regions and the federal administration. In order to illustrate the practical reality of the coordination between the different actors involved in the governance of geospatial data and e-services, the researchers also used qualitative analysis via interviews with the key actors, and a quantitative analysis in the form on an online survey. Adopting this approach allowed them not only to understand the formal governance structures, but also the importance of informal coordination.

The combination of these three methods provided answers to the research questions in an inclusive way. The document analysis, in combination with the interviews (both qualitative methods), answers the first ("Who are the leading public sector actors with regards to geospatial e-services?"), the third ("What types of coordination mechanisms are used in the field of geospatial data and e-services?") and the fourth ("How can the current governance structures be explained?") research question. The combined

quantitative and qualitative approach creates the possibility to understand the governance structures and to explain them. The interviews are especially useful to understand the meaning of certain choices and events as well as to explain why and how a certain coordination approach emerged [25]. As geospatial e-services depend on geospatial data, it was important to understand who the users and producers of geospatial data are, the second research question. This question could only be answered via a large-scale survey among the users and producers of geospatial data and e-services in Belgium. Therefore the online survey was also used.

Firstly, the documents that define the governance landscape of geospatial e-services and data have been reviewed. Those texts are a valuable source of information as they provide an overview of the different tasks and roles of different organisations. The documents include a vast amount of qualitative data that are useful for answering the research questions—especially the first research question. Analysing documents has, however, one main weakness. They do not always represent the reality of the organisation. Therefore, interviews are especially useful as they allow us to get an insight into the way key actors experience reality [26,27].

Secondly, interviews were conducted with the various stakeholders between August 2016 and May 2017. The in-depth interviews allowed the researchers to collect information that would not be collectable via an online survey or via the document analysis. As Maxwell [25] underlines, qualitative exploratory research—such as the interviews that were conducted—helps to understand the phenomena and events in which the stakeholders are involved.

A list of the organisations visited and whose key representatives were interviewed can be found in Table 2. These organisations were selected on the basis of their link to geospatial data and e-services, and included the following administrative levels: Federal level, regional level, local communities and organisations representing their interests and the European Commission because of the INSPIRE Directive [15], the Directive on the re-use of public sector information [16,17] and the ISA & ISA^2 programs [28]. The private sector was included via the AGORIA GEO-ICT Group, the main representative organisation of the private sector for geospatial data in Belgium, Proximus, the leading Belgian telecom operator, and BPOST, the main post company.

Table 2. Organisations interviewed between August 2016 and May 2017 (listed chronologically).

	Type of Organisation	Administrative Level	Organisation
1	Administration	Federal	Emergency Service A.S.T.R.I.D
2	Administration	Federal	Federal Police
3	Administration	Federal	FPS Economy, SMEs, Self-employed and Energy
4	Administration	Federal	FPS Finance—General Administration of the Patrimonial Documentation
5	Administration	Federal	FPS Information and Communication Technology (FEDICT)—Person 1
6	Administration	Federal	FPS Information and Communication Technology (FEDICT)—Person 2
7	Administration	Federal	FPS Internal Affairs
8	Administration	Federal	FPS Mobility
9	Administration	Federal	FPS Public Integration and FPS Finance
10	Administration	Federal	INFRABEL
11	Administration	Federal	Ministry of Defence
12	Administration	Federal	Privacy Commission
13	Administration	Federal	Royal Meteorological Institute of Belgium
14	Administration	Federal	Royal Observatory of Belgium
15	Administration	Federal	Service for Administrative Simplification
16	Administration	Federal	Social Security Service
17	Administration	Federal	State Archives of Belgium
18	Administration	Federal	State Archives of Belgium
19	Administration	Brussels Capital Region	Brussels Regional Informatics Centre (BRIC)
20	Administration	Flemish Region	Agency Information Flanders
21	Administration	Walloon Region	e-Wallonia-Brussels Simplification, Department for Geomatics, Walloon Crossroads Bank
22	Administration	Walloon Region	DG Economy
23	Administration	Local	Flemish Organisation of Local Cities and Municipalities (VVSG)
24	Administration	Local	Municipalities of Saint-Gilles and Brussels
25	Administration	Local	Union of Villages and Cities of Wallonia (UVCW)
26	Administration	European	European Commission—DG CONNECT—Person 1
27	Administration	European	European Commission—DG CONNECT—Person 2
28	Administration	European	European Commission—DG CONNECT—Person 3

Table 2. *Cont.*

	Type of Organisation	Administrative Level	Organisation
29	Public-private sector		Intermunicipal Company for Informational and Organisational Mutualisation (iMio)
30	Public-Private Sector		SMALS
31	Private sector		AGORIA GEO-ICT Group—Person 1
32	Private sector		AGORIA GEO-ICT Group—Person 2
33	Private sector		BPOST
34	Private sector		Proximus
35	NGO		EUROCITIES

Source: FLEXPUB research project [29].

The form that the interviews took can be considered as between the "interview guide approach" and the "standardised open-ended interview". All the topics to be discussed were decided in advance and some questions were predefined and standardised for all the respondents. Sometimes the questions differed slightly as not all topics were relevant for each organisation. In this way, it was ensured that the data were collected in a systematic way, while allowing for a certain level of flexibility [30,31].

The analysis of the interviews was conducted on the basis of the COBIT 5 enablers [32]. The description of each enabler was used to analyse the textual outcome of each interview. In this way an overview of the different respondent positions was obtained, structured on the basis of the COBIT 5 enablers. Making use of those enablers ensured that the research took an all-encompassing approach when analysing the research data. This approach fits within the research spirit as it underlines that geospatial e-services are not just technological objects but also have an important social element. The COBIT framework was developed by the Information Systems Audit and Control Association (ISACA) in 1992, and is internationally recognised as a framework for IT governance bringing together international best-practices. In 2012 ISACA released a new version of the framework, COBIT 5, which is currently the most recent version of COBIT [33]. The fact that the COBIT 5 framework offers an all-encompassing methodology is both its main strength and weakness. Based on the fact that the framework is originally developed for the private sector and the knowledge that is too all-encompassing to use as a whole, it has been decided to use COBIT 5 as a general stepping-stone while giving it an interpretation linked to the approaches used in the public sector. The following enablers are described within COBIT 5 [32];

- Processes
- Organisational structure
- Culture, ethics and behaviour
- Principles, policies and frameworks
- Information
- Services, infrastructure and applications
- People, skills and competencies

Besides the review of the legal texts and the interviews, a third research approach was used. An online survey was conducted in the period December 2016–February 2017. It was mainly used as an explorative and descriptive instrument to underpin the findings of the interviews related to the governance of geospatial data and e-services [34]. The survey data used in this article focused on the willingness of the federal level and the regions to collaborate, the users and producers of geospatial data, and the source of origin for different types of geospatial data.

As the online questionnaire is an exploratory tool, it was ensured that all the different layers of the Belgian administration as well as the private sector organisations with a connection to the administration were included. Organisations were selected based on their relation to e-services or geospatial data. Within those organisations, a new selection of possible respondents was made on the basis of their relevancy to the topic. The population for this research was selected on their direct

connection to the development and maintenance of e-services and/or geospatial data. The following levels were contacted:

- **Federal level**: Federal Public Services, Public Planning Services, Scientific Institutions, Federal Institutions of Public Interest, Public Welfare Institutions, Federal Police and Ministry of Defence.
- **Regional level**: Flemish Region, Walloon Region and Brussels Capital Region.
- **Provincial level**: The administration of the 10 Belgian provinces.
- **Communities**: The administrative head of each community was contacted. Additionally, the Flemish and Walloon organisations representing the local entities were contacted.
- **Private Sector**: A random selection made via an online business directory for consumers, based on the provinces and the Brussels Capital Region was conducted for the following groups: Architects, building companies, land surveyors and notaries. Those groups can only execute their work by making use of geospatial data. Furthermore, the members of the Belgian private sector federation AGORIA GEO-ICT were contacted, as well as the four main consultancy companies (Deloitte Belgium, PwC Belgium, EY Belgium and KPMG Belgium).
- **Public-Private Sector**: The four main Belgian utility companies were contacted, as their functioning is strongly linked to geospatial data (Régie de l'Electricité de Wavre, Fluxys, ORES and EANDIS).

The questionnaire was sent to a total of 1317 respondents leading to an overall response rate of 15.1%. Leaving out the communities, however, leads to a higher response rate of 23.3%. A detailed overview of the response rate (in absolute numbers and percentages) can be found in Table 3.

Table 3. Online survey response data according to targeted group.

Target Group	Sample Size	Number of Respondents	Response Rate %
Federal administrations	210	63	30.0%
Regional administrations	293	67	22.8%
Provincial administrations	120	18	15.0%
Private sector	95	18	18.9%
Private–public partnerships	7	3	42.8%
Sub Total	725	169	23.3%
Communities	592	30	5.1%
Total	1317	199	15.1%

Source: FLEXPUB research project [35].

In order to increase the response rate, three reminders were sent. Institutions of the Belgian federal level with a strong impact on (geospatial) e-services that did not reply were contacted by telephone. The survey was managed by IVOX. It is important to mention the objective role of IVOX: this respected company conducts surveys for public and private actors and supported the online questionnaire via its technical expertise.

The results of the online survey were analysed via the program IBM SPSS Statistics 24. A number of questions that included written text were analysed manually. Before starting the analysis, the quality of the data was examined: It was considered that for each of the respondents the data quality was sufficient to be used in the analysis. In the questionnaire a textbox was included at the end of the questionnaire in which the respondents were able to write down what they expect of future geospatial e-services: 66 out of the 201 respondents did not fill in anything in this textbox. Writing nothing in this textbox might mean that there was no interest in the survey, and could imply that the data were not correct. Therefore, the researchers checked for those 66 respondents if they wrote down what role they have in their organisation. Filling in this question with a clear function title also shows if the survey was filled in in a serious way, as it is one of the last questions and the researchers presume that the other questions were therefore answered in a serious and honest way. Of the 66 respondents, there were only four respondents who not write down a clear function title. Those four respondents were verified

via their answers on the statements that were included in the questionnaire. Finally, it was agreed to include those four respondents in the analysis: two of them were known personally to the researchers and showed a strong interest in the project, and two others gave replies to other questions that were in line with the other respondents.

3. Results

In Section 3.1, the leading public sector actors with regards to geospatial e-services are presented. The main actors of the federal administration, as well as the three regional administrations, are discussed and their relations analysed. Section 3.2 gives a deeper look at the users and producers of geospatial data, and the source of origin for the geospatial data, based on a categorisation of 20 types of geospatial data. Finally, Section 3.3 analyses what types of coordination are used in the field of geospatial data and e-services.

3.1. Leading Public Sector Actors at Different Administrative Levels

3.1.1. Federal Organisations

At the Belgian federal level the National Geographic Institute (NGI) as well as the Federal Public Service (FPS) Finance and the newly created FPS Policy and Support are supposed to play a leading role in the creation of geospatial e-services: Those organisations are key as they all have a leading role in the creation of geospatial data or in the development of e-services.

- **National Geographic Institute:** This organisation takes the central governance position within the field of geospatial data at the federal level, both from a historical and judicial position [36,37]. However, the organisation seems to struggle with developing geospatial e-services: A digital topographic map, "CartoWeb.be" has been developed, but other geospatial data are often only available in formats that do not allow to be integrated in already existing e-services of the federal organisation responsible for e-government policy, the FPS Policy and Support [38]. Recently (March 2017) the federal geoportal "geo.be", was launched. This is, however, almost six years after the transposition of the INSPIRE Directive into law [39,40]. Finally, the NGI, the State Archives of Belgium, the Royal Library and the Africa Museum have developed an e-service for historical maps of Belgium and Central Africa [41].
- **FPS Finance—General Administration for the Patrimonial Documentation**: The General Administration is one of the six General Administrations of the FPS Finance. From a historical perspective, this organisation has been, together with the NGI and its predecessors, one of the cornerstones of the geospatial data via the creation and maintenance of cadastral plans and the organisation of the cadastral taxation—one of the key instruments of a country. Also today it remains responsible for conserving and updating the cadastral documentation and maps [42]. The General Administration has developed its own geospatial e-services for exchanging information with governmental and non-governmental users: "URBAIN" for the exchange of patrimonial information with the 589 communities, "MyRentPro" for the registration of tenancy agreements for housing by estate agents and "CadGIS" for consultation, by private individuals of the cadastral plan [43].
- **FPS Policy and Support:** Until early 2017, the FPS Information and Communication Technology (FEDICT) was responsible for the overall e-government policy of the federal administration. Besides the development of a common strategy, the aim was also to support other federal organisations in implementing the strategy and developing norms, standards and a basic architecture for e-services. However, since its founding in 2001, there has been no specific focus on using geospatial data within e-services, the organisation has witnessed strong budgetary decreases, and lacked the necessary power to position itself within the broader federal administration. In March 2017, the new FPS Policy and Support was created. The Directorate-General for Digital Transformation (DTO) within this FPS has taken over the tasks of the former FEDICT. Besides the DTO, a "G-Cloud" (Government Cloud) has been set-up: "The G-Cloud strives to

a maximal cooperation between federal organisations in the field of basic ICT infrastructure" [44]. It remains to be seen how effective the DTO will be in relation to the other actors within the federal administration. Although the focus on geospatial data has been very limited within FEDICT, there are a few examples of e-services that make, to a limited extent, use of geospatial data. An example is the "4th Way", this e-service allows notaries and civil servant to collect debts when there is public sale or registration of real estate [45]. Another example of an e-service developed by FEDICT is "eBirth". When a baby is born, the birth is registered electronically way and the information is send digitally to the necessary governmental organisations, such as the community, for the registration of the birth place [46].

So, there are three main actors related to geospatial e-services at the federal level. It should, however, be underlined that there is currently a mismatch between the different capacities of the organisations. The organisation responsible for e-services does not have the necessary expertise to include the geospatial component in e-services, and the NGI lacks the necessary capacity to develop widespread geospatial e-services. Only FPS Finance combines its geospatial data and e-services in a proactive way.

3.1.2. Brussels Capital Region

In 1987 the Brussels Capital Region Government decided to create the "Brussels Regional Informatics Centre" (BRIC) and mandated it with all tasks related to the development and assistance of other actors in the Brussels Capital Region, concerning the topics of informatics, telematics or cartography [47]. As such, the region was the first in Belgium to make a clear connection between informatics and geospatial data. Besides the BRIC, however, other organisations have a clear connection with geospatial data. These are members of the "GeoBru Committee". This Committee, in charge of implementing the INSPIRE Directive, consists of six organisations: The Brussels Planning Office, the Brussels Institute for Environmental Management, the BRIC, the Brussels Urban Development and Heritage, Brussels Mobility and the Company for Interurban Transport in Brussels. Other governmental organisations contributing to the Brussels geoportal can be represented, but without voting rights. Although the different organisations still tend to develop their own geospatial e-services, there is a general acceptance and use of the geospatial data of the Brussels Urban Information System (UrbIS) offered by the BRIC. Examples of geospatial e-services developed with UrbIS are "fixmystreet.brussels", this e-service allows users to make an online mention of incidents in the public domain and to follow the actions taken by the administration to solve the incident, and the "Brussels Mobility Realtime e-service", this web service allows users to receive real-time mobility information [48,49]. Another example is the "Building Permit Viewer", it allows users to follow the granting of building permits on a map. There is general information available for all building permits granted in the region, and one can also log on and take actions on personal building permits [50]. As such, all organisations use the same basis for their geospatial e-services [51].

3.1.3. Flemish Region

The organisation responsible for the coordination, organisation and provision of services related to the Geospatial Data Infrastructure was founded in 2004 as the Agency for Geospatial Information Flanders. The organisation's mission was extended to include the overall promotion and use of geospatial data in Flanders [52,53]. Recently, it was decided to merge the previously separated Agency for Geospatial Information Flanders and the Department Information Flanders, into the new "Agency Information Flanders" (AIV). The agency aims "to build up a coherent government-wide information policy and to support and realise the transition of the Flemish administration towards an information-driven administration" [54]. Merging those two organisations was logical as location appeared in a wide range of policy areas. Also, the newly created organisation brings information and expertise together. Furthermore, there is a budgetary element included in the organisational reshuffling: Services existing in the two organisations can be merged.

However, the new organisational structure has mainly created a policy steering and development agency that is not providing any IT tools. That is the task of the "Facility Company" of the Flemish administration. This has led to a certain level of friction and tensions, as it is not always clear who is responsible for the different tasks—especially concerning new IT-developments within the Flemish administration. Furthermore, the merging of the agency responsible for geospatial information and the organisation responsible for the non-geospatial information risks underestimating the importance of geospatial data in the overall policy of the Flemish administration. This would be the opposite of the original aim of creating more visibility and impact of all governmental information.

A first example of an e-service is the "Large-Scale Reference File", the topographic map of Flanders that is available as an e-service for all users active in the Flemish Region [55,56]. Furthermore, there is also the Flemish regional geoportal, "geopunt.be", created by the 2009 Geographic Data Infrastructure (GDI) Decree [53]. Another e-service is the "Central Address Reference File", created in 2009 by the Central Address Reference File (CRAB) Decree [57]. Together with the Large-Scale Reference File, the Central Address Reference File is one of the basic elements in defining the geospatial infrastructure and future geospatial e-services [58]. Finally, the Generic Information Platform Public Domain (GIPOD) Decree provides the legal basis for the "Generic Information Platform Public Domain" [59]. This e-service allows users of the public domain to inform other users of their actions in the public domain, for example when public works are planned or when there is a public event leading to the closure of roads [60].

3.1.4. Walloon Region

Two organisations are responsible for the overall coordination of geospatial data and e-services, the Department for Geomatics and e-Wallonie-Bruxelles Simplification. The Department for Geomatics is the leading Walloon organisation: It is responsible for shaping the optimal conditions to use geospatial data, both from a technical and judicial point of view. The organisation is expected to increase the visibility and knowledge on geospatial data towards governmental and non-governmental actors [61].

In executing those tasks, the Department for Geomatics is closely cooperating with e-Wallonie-Bruxelles Simplification: This organisation's task is to increase the digitalisation and overall simplification of the administration as it provides services to other organisations of the Walloon Region and the French Community—similar to the situation in Flanders, where AIV provides services to the Flemish Region and the Flemish Community. Specifically it is responsible for the provision of advice, the crossroads bank for data sharing, the operational implementation of e-services and the overall performance evaluation of e-government in Wallonia and the French Community [62,63].

Even though the Department for Geomatics and e-Wallonie-Bruxelles Simplification are responsible for the horizontal policy coordination within the Walloon administration, there are a number of other departments and directions responsible for geospatial data within their specific, vertical policy domain. The most well-known example is the Directory of Geomatics within the Directory-General of Land Use and Urban Planning, which develops, in coordination with the abovementioned Department for Geomatics policies and consultation tools for geospatial data [64]. Besides e-Wallonie-Bruxelles Simplification, there is a second actor responsible for the development and maintenance of the IT infrastructure of the Walloon Region: the Department of Information and Communication Technologies, which falls under the responsibility of the Directory-General for Budget, Logistics and ICT. As such, there are four key actors involved in the development and maintenance of geospatial e-services [65]. Examples of geospatial e-services developed by those actors are "WalOnMap", the Walloon geoportal, and the "Central Inventory of Addresses and Streets in Wallonia" (ICAR), the Walloon counterpart of the Flemish CRAB e-service [66,67]. Another example is the "Ongoing Cartographic Information Project" (PICC): Just like in the Flemish Region, the Walloon Region also developed its own topographic map [68].

3.2. Geospatial Data Users and Producers

Besides the legal formal organisational structures, there is also the practical reality of sharing data. Understanding a governance structure implies more than analysing the main organisations and their relations from a legal point of view. It is necessary to understand the day-to-day exchange of geospatial data. Therefore, the second research question studies who the users and producers of geospatial data are, and what the source of origin of their data is. For 20 types of geospatial data—defined by the International Organization for Standardization in Standard 19115 (international standard to describe geospatial information and services)—the main users (those organisations that use the data at the moment of responding to the survey) and producers (those that produce the data at the moment of responding to the survey) were identified [69]. Those 20 types of geospatial data, defined by ISO Standards 19115, are described in Table 4.

The most commonly used type of data is "Location" with 74 users out of the 111 organisations that responded to the questionnaire. This is followed by "Planning Cadastre" used by 71 organisations and "Base Maps Earth Cover" used by 64 organisations. The types of data with the lowest number of user organisations are "Oceans", only nine users, and "Intelligence Military" with only 13 users.

For half of the different types of data, the leading public organisations described above play a key role. At the federal level, the NGI is one of the main actors concerning the more traditional types of geospatial data such as "Elevation", "Base Maps Earth Cover", "Earth Imagery", "Inland Waters", "Location" and "Structure". FPS Finance plays a key role for "Planning Cadastre". From a Flemish regional perspective, AIV overall has a strong position for sharing data with other organisations and is indicated for different categories as the main source or one of the main sources of origin. On the basis of the analysis of the leading public sector actors, it was expected that these actors would also play a key role in the network of users and data producers for the 20 types of geospatial data. The NGI and the FPS Finance indeed function as a producer, and as one of the main sources of origin for different types of data. AIV indeed acts as one of the key distributors of geospatial data and to a minor extent also produces data. For the Walloon Region, however, the Department for Geomatics does not appear as one of the key actors in the network of users and producers of data. Rather, the vertical organisations, focusing on specific policy areas, of the Walloon administration appear to be both responsible for the production and exchange of the data. No centralised system for exchanging data exists in the Walloon administration. The Department for Geomatics is nevertheless expected to "create the optimal conditions to use the geospatial data" and to "ensure the diffusion of Walloon geospatial data" [61]. This is in strong contrast to the Flemish Region, were AIV plays a key role in the distribution of the majority of geospatial data.

Another remarkable observation is that in types of data such as "Climate Meteorology", "Defence", "Economy", "Oceans" and "Transportation", the organisations described above have almost no function in the network of users and producers. Other, more specialised organisations are pointed to as the source of origin for the data. "Climate Meteorology" data, for example, are mainly the area of the Royal Meteorological Institute. The FPS Economy and the Departments responsible for the Economy in the regions have a prominent role for the "Economy" type of data, and for "Defence" the Ministry of Defence is the source of origin.

Finally, there were three types of data for which not a single key actor could be identified: "Health", "Society" and "Utilities Communication". "Health" and "Society" are not always associated with geospatial data; as such, there might not be enough focus on the key geospatial actors for this type of data. However, "Utilities communication", for which both the Flemish and federal administration developed geospatial e-services, is very much related to location: the Federal Cable and Pipe Information Checkpoint (KLIM) and the Flemish Cable and Pipe Information Portal (KLIP) [70,71]. Both are geospatial e-services and inform users on the precise location of cables and pipes that can be found in the public subsoil in areas where they, as users, plan works. The federal e-service can be used by users planning engineering works in any area in Belgium, the Flemish KLIP e-service only

in Flanders. It is surprising that the organisations developing these types of e-services are not taking a prominent role in the source of origin for this type of data.

Table 4. Use–produce–origin description for 20 types of geospatial data.

Type of Data	Description Use—Produce—Origin
Location (positional information and services, e.g., addresses, geodetic networks, control points, postal zones and services, place names)	• 74 user organisations • 32 producing organisations • The data mainly originate from the NGI, AIV and the private sector actors such as TomTom, Google Maps. The NGI takes a central role at the federal level. AIV is a key source for organisations with a link to Flanders.
Planning Cadastre (information used for appropriate actions for future use of the land, e.g., land use maps, zoning maps, cadastral surveys, land ownership)	• 71 user organisations • 15 producing organisations • The FPS Finance, responsible for Cadastral Information is the main source of origin: 48 organisations indicated that their information originates from FPS Finance.
Base Maps Earth Cover (e.g., land cover, topographic maps)	• 64 user organisations • 14 producing organisations • The NGI plays a dominant role as a provider of data, shared with AIV. The PSW is also indicated as a source for this data, but to a lower extent than NGI and AIV.
Environment (environmental resources, protection and conservation, e.g., pollution, waste storage and treatment, nature reserves)	• 56 user organisations • 24 producing organisations • A dominant role of the regions. Data mainly used by organisations with a link to the local level; AIV has a prominent but no dominant role, together with the Walloon DG for Agriculture, Natural Resources and the Environment.
Earth Imagery (Images of the Earth, e.g., satellite imagery, aerial photographs, LIDAR)	• 56 user organisations • 14 producing organisations • At the federal level, the NGI is one of the main sources. AIV dominates the other categories. No key organisation indicated within the Walloon administration. Google Maps is also mentioned but only seven times.
Boundaries (legal land descriptions, e.g., political and administrative boundaries)	• 55 user organisations • 8 producing organisations • AIV is often cited as source of origin, while it uses information of the FPS Finance. NGI, also cited as a source of data, produces the data themselves. Google Maps and TomTom data do not seem to be used on a regular basis: Only mentioned four times as source of origin.
Structure (man-made construction, e.g., buildings, museums, religious buildings, factories, housing, monuments, shops, towers)	• 51 user organisations • 19 producing organisations • AIV has a strong impact of the diffusion of the data. Role of the NGI is limited and related to the federal level.

Table 4. *Cont.*

Type of Data	Description Use—Produce—Origin
Transportation (means and aids for conveying persons and/or goods, e.g., roads, airports, tunnels, nautical charts, vessel location, aeronautical charts, railways)	• 48 user organisations • 21 producing organisations • Only the federal railway company and the Flemish bus company are mentioned as source of origin
Economy (economic activities, conditions and employment, e.g., commerce, industry, tourism, exploitation of resources)	• 44 user organisations • 19 producing organisation • Less impact of the NGI and/or AIV. The FPS Economy, the Flemish Department of Innovation & Entrepreneurship and the Walloon DG for Economy, Employment and Research have prominent roles.
Farming (rearing of animals and/or cultivation of plants, e.g., agriculture, plantations, livestock, etc.)	• 41 user organisations • 12 producing organisations • Dominant role of the regions. Main distributors are AIV, receiving its data from the Department of Agriculture and Fisheries, and Walloon DG for Agriculture, Natural Resources and the Environment.
Elevation (height above or below sea level, e.g., altitude, bathymetry)	• 41 user organisations • 13 producing organisations • AIV is in a key position: 17 organisations indicate that that their data originates from them.
Inland Waters (inland water features, drainage systems and their characteristics, e.g., rivers, water utilisation plans, dams, floods)	• 41 user organisations • 11 producing organisations • NGI is the main source at the federal level. AIV is highly consulted by other levels. A particular situation in Wallonia: three different DGs are mentioned as source of origin.
Society (characteristics of society and cultures, e.g., archaeology, education, demographic data, recreational areas and activities, crime and justice)	• 39 user organisations • 21 producing organisations • Clear sharing structure is missing: Not a single organisation emerges as a key source of origin.
Utilities Communication (energy, water and waste systems and communications infrastructure and services, e.g., solar and nuclear sources of energy, water distribution, sewage, electricity and gas distribution, telecommunication networks)	• 30 user organisations • 6 producing organisations • No central distributor for this type of data.
Biota (flora and/or fauna in the natural environment, e.g., wildlife, vegetation, habitat)	• 27 user organisations • 10 producing organisations • AIV acts as distributor for data of the Flemish Agency of Nature and Forest, the Flemish Institute of Nature and Forest Research and the Flemish Department of Environment, Nature and Energy. Walloon organisations indicate that their data originates from the DG for Agriculture, Natural Resources and the Environment.
Health (health, health services, human ecology, and safety, e.g., disease and illness, hygiene, health services)	• 27 user organisations • 9 producing organisations • Although the majority of the social security organisations of the federal administration participated, they do not appear as a user.

Table 4. *Cont.*

Type of Data	Description Use—Produce—Origin
Geoscientific Information (information pertaining to earth sciences, e.g., geophysics, geology, earthquakes)	• 25 user organisations • 11 producing organisations • AIV is mentioned five times as source of origin, the PSW is indicated by three organisations as their source of data.
Climatology/Meteorology (processes and phenomena of the atmosphere, e.g., weather, climate, atmospheric conditions)	• 24 user organisations • 7 producing organisations • Dominant role of the Royal Meteorological Institute.
Intelligence Military (military bases, structures, activities, e.g., military buildings and transportation)	• 13 user organisations • 5 producing organisations • Always linked to the Ministry of Defence.
Oceans (features and characteristics of saltwater bodies, e.g., tides, coastal information, reefs)	• 9 user organisations • 3 producing organisations • Only type of data for which organisations indicated that they use non-Belgian sources such as European Commission, European Space Agency and NASA. Flemish organisations use their own data.

Source: FLEXPUB research project [35].

3.3. Coordination in the Field of Geospatial E-Services

The section addresses the third research question: What types of coordination mechanisms are used in the field of geospatial data and e-services? The three regions and the federal administration all have their own means of coordination in the field of geospatial data and e-services, whereas the intergovernmental coordination between the four actors appears to be organised via a weak form of network governance. The INSPIRE Directive has been an active driver of cooperation and increased coordination in the field of geospatial e-services.

3.3.1. Federal Administration

In 2010 the three regions and the federal government reached an agreement on the coordination of the infrastructure for geospatial information [72]. As a result of the INSPIRE Directive the four actors were obliged to agree on the overall implementation of this directive. Although the agreement was reached in April 2010, it was only in December 2011 that the directive was transposed into federal law. The interviews with different actors of the federal administration learned that before the transposition of the INSPIRE Directive no strongly formalised structures existed for exchanging data or setting up geospatial e-services. Geospatial data are very often exchanged in an ad hoc way between organisations, sometimes even without official agreement of the senior level of the administration, as this is too time-consuming. Also, although the role of the NGI and the FPS Finance might be clear, it is difficult for other organisations to see the added value of geospatial data and e-services. Furthermore, there is still no official exchange mechanism for geospatial data. Although FEDICT could have acted as a data exchanger for geospatial data, this has never been the case [73]. Moreover, FEDICT has over the years only developed a few e-services, which include—to a minor extent—geospatial data. This is probably the result of a combination of different factors: At the time that FEDICT was founded, in 2001, the majority of the federal institutions already had their own internal ICT department and continued to use their own service for developing e-services—e.g., FPS Finance or NGI. Furthermore, the budget of FEDICT has decreased systematically as a result of the austerity measures of the federal government. Finally, SMALS, a private sector company owned by the federal social security actors, had already developed and maintained e-services for other—mainly social-security-related—organisations at the

federal level. FEDICT was as such the extra actor that came into the field, and never had sufficient capacity to play the role that it was expected to play.

Therefore, it can be argued that before the INSPIRE Directive was transposed into law in 2011, there was no real governance of geospatial e-services: Each federal organisation was acting on its own, without taking a common vision or strategy into account. There was insufficient leadership in the field of e-services, and a total lack of it in the field of geospatial data. The INSPIRE Directive, however, forced the federal organisations to start cooperation in this area. The NGI was legally instructed to create a network of services related to the geospatial data referred to in the Annexes of the INSPIRE Directive, and to set-up a federal geoportal. Whereas cooperation was lacking before the implementation of the INSPIRE Directive, some form of a network was created as a result of the directive. Hierarchical governance was used to promote a network approach for geospatial data, but it remains to be seen what the impact of the newly created FPS Policy and Support will be on the overall coordination.

3.3.2. Brussels Capital Region

BRIC already had from 1987 the legal mandate to develop services and to provide assistance to other actors in the Brussels Capital Region concerning topics of informatics, telematics and cartography. When, at the end of the 20th century, BRIC had the opportunity to buy the legal rights for the geospatial data belonging, until then, to the local authorities of the Brussels Capital Region, it consolidated and strengthened its legal—and hierarchical—position for developing geospatial e-services. BRIC took this opportunity, and started to develop the UrbIS products. These digital 'cartographic' products are available for all governmental organisations of the Brussels Capital Region, citizens and private sector actors [74,75]. The products can be used by governmental organisations as a basis tool for the development of their geospatial e-services. Although governmental organisations started to use these UrbIS products, which created a certain level of coordination, it remained a weak form of cooperation that did not lead to an optimal functioning of geospatial e-services.

When in 2010 the GeoBru Committee was created via the transposition of the INSPIRE Directive, there was not much formalised cooperation between the different organisations of the Brussel Capital Region. The only form of coordination, besides informal and personal contacts between organisations, was semi-official events that aimed to bring together the different actors involved in geospatial e-services: It remained, however, rather informal and informative [76]. Since the creation of the GeoBru Committee in 2010, however, which was imposed hierarchically, coordination between governmental organisations has improved and it is also expected that cooperation goes beyond just implementing the INSPIRE Directive. However, there are complaints from the communities about the strong hierarchical and dominant position that is taken by BRIC towards them. New e-service tools are developed without taking the needs of the local authorities into account. This situation is also accentuated by the fact that UrbIS and its products have been legally consolidated as the digital cartographic reference databank [51].

It can therefore be argued that the Brussels Capital Region is characterised by a strong hierarchical dominance of BRIC—which is, according to BRIC, creating the necessary unity between the different governmental actors. This is, however, combined with a certain level of network governance in which the different actors of the Brussels Capital Region can have their say via the official GeoBru Comité.

3.3.3. Flemish Region

The governance of geospatial data and e-services of the Flemish Region appears to be characterised by a mixture of hierarchy and network governance. On one hand the subsequent Flemish governments and the administration, AIV and its predecessors, have worked in an active way on a set of legally binding instruments that created the overall framework for geospatial data sharing and e-services. There are multiple examples of this policy. In 2000 the Flemish Parliament agreed on the proposed GRB (Large-scale Reference File) Decree [57], and later also on the KLIP (Cable and Pipe Information

Platform) Decree (2008) [71], the GDI (Geographic Data Infrastructure) Decree (2009) [53], the CRAB (Central Address Reference File) Decree (2009) [57] and the GIPOD (Generic Information Platform Public Domain) Decree (2014) [59]. This "legalisation" not only has an effect on the Flemish administration, but especially on the Flemish communities, which fall under the responsibility of the region. The Flemish administration aims, via these legally binding decrees, to ensure a high level of standardisation. The communities underline that the hierarchical focus of the Flemish administration, with its standards, supervision and inspection, is strong and often does not sufficiently involve the communities. They do, however, recognise that geospatial data and e-service require a high level of standardisation and as such might require certain hierarchical governance structures.

There is, however, a certain level of network governance present in the Flemish management of geospatial e-services. Although AIV and its predecessors were and are responsible for the development of (geospatial) e-government and accompanying e-services, they still had and have to obtain and maintain the necessary confidence and trust of the other organisations of the Flemish regional administration. Without the support of the other organisations AIV would not be able to position itself in the way it currently does. One of the respondents underlined in this respect that AIV and its predecessors have a strong and trustable reputation. This created an advantage in comparison to the organisations of the federal administration. Those federal organisations have a long history, interspersed with procedures and processes that are not well suited to the digital world. Furthermore, the Flemish Region has, since the start of its geospatial data infrastructure (GDI) in 2000, created a number of councils that allowed public entities to actively participate in the creation of the Flemish Geospatial Data Infrastructure. The Steering Group GDI Flanders, the GDI Council and the Working Group GDI Flanders, created for the implementation of the GDI Flanders, provide for a for all stakeholders to communicate their geospatial requirements [77].

3.3.4. Walloon Region

Similar to the federal administration, the transposition of the INSPIRE Directive appears to have been a driver of reform in the Walloon administration: After the agreement between the three regions and the federal government had been reached in April 2010, the INSPIRE Directive was only transposed into a decree, the so-called Geospatial Information Infrastructure Decree, in December 2010 [78]. With the transposition a framework for coordination was created in the Walloon Region. A Strategic Committee for Geomatics was founded, to be chaired by the Department for Geomatics. The Committee is responsible for the overall coordination of the different actors in Wallonia related to geospatial data and e-services, for the development of the Walloon geospatial information infrastructure and for drafting the Strategic Geomatics Plan. The Committee groups all the DGs of the Walloon administration, as well as the Walloon local level, the regional crisis centre, and the regional service providers. However, today there is still a lack of a harmonised view among the different actors of the Walloon administration. This might for example explain why it took the Walloon administration four years to draft a Strategic Geomatics Plan. An external consultant had to be called in because there was, apart from the lack of sufficient capacity, a lack of common understanding on what should be the priorities. The Strategic Geomatics Plan 2017–2019 is an exact copy of the previous plan, and it is only now that the Walloon administration is starting with the implementation of the first plan. Therefore the Committee has developed an Operational Geomatics Plan: It aims to bring more coherence into the geospatial data and e-services of the Walloon administration. The Operational Geomatics Plan shows a certain level of unity among the different partners of the Committee [79]. So, the Walloon administration seems to be characterised by a certain level of network governance that appeared after the transposition of the INSPIRE Directive.

3.3.5. The Belgian Governance: Cooperation between Three Regional Administrations and the Federal Administration

As a result of the strong autonomy of the regions, the four actors have concluded a number of agreements that are legally binding. With these agreements the regions and the federal level aimed to establish a common basis for the future cooperation and development on the topics of e-government, geospatial data and e-services. The agreements were necessary as they are part of the legal backbone for the future development of geospatial e-services [80]. The agreements show that there is a certain willingness of the four actors to cooperate in a weak form of network governance.

Concerning e-government, there have been agreements in 2001 and 2006. Both expired, however. When the 2006 agreement expired, it took the four actors three years to define a new one. This is illustrative of the relationship between them. All three agreements led to the establishment of a Strategic Committee in which the four actors are represented [81]. The added value of those agreements is, however, questionable: There are no visible public results and there is almost no information on what the Strategic Committee does. One of the technical working groups, the Technical Working group on interoperability, has met in this respect for the last time in October 2016. From the reports it can be ascertained that the meetings are rather informal. These rather poor results are not surprising and seem to be the result of the lack of a common vision and strategy on e-government [82,83].

Concerning geospatial data, three important agreements have been concluded. The first was the agreement for the coordination of the infrastructure for geospatial information. This agreement, which is a partial transposition of the INSPIRE Directive, aimed to ensure the cooperation of the three regional administrations and the federal administration. One of the main points of the agreement was the creation of the Coordination Committee: Representatives of the four actors are members, and it ensures the overall coordination of the INSPIRE implementation in Belgium. However, this Committee is also mainly an information-sharing platform. Nevertheless, the Committee occupies a unique position in the field of geospatial data: For the first time the three regions and the federal administration are communicating with each other in a formal way. This is an important achievement as it has led to a weak form of network governance. However, due to the fact that the Committee does not have individual staff or budget, its influence is rather weak.

The second agreement, focusing on the coordination structure for patrimonial information was concluded in 2014. This agreement aims to ensure a coordinated exchange and update of patrimonial information. This agreement is the direct result of a political recognition that cooperation is necessary [84,85]. A new and common organisation was created between the regions and the federal level that is responsible for improving the coordination. Although it took until 2017 before it became publicly visible it is expected to deliver concrete results. The three regions and the federal administration recognize the need for a common and properly functioning patrimonial documentation. Data will be exchanged free of charge among the governmental users, and external non-governmental users are offered a single digital point of contact [86]. So for this area of geospatial information an institutionalised form of network coordination has emerged, via an agreement between the regions and the federal level. It remains to be seen what the effect of the new organisation will be on overall cooperation.

Finally, an agreement has been reached on the topic of address data. As it is a pre-condition for well-functioning geospatial e-services to have a common address structure, the three regions have been working on a common address structure since the beginning of the 21st century. Although there are agreements on the meaning of an address from a judicial point of view, the regions still have different ways of approaching those agreements and implementing them. In this agreement the three regions agreed on an organisational structure to solve the common problems with addresses. Although a common structure was created in the form of an Address Committee—which has to report on a regular basis to the National INSPIRE Committee and the Strategic Committee on e-government—there is no agreement on the common problems. This was, however, to be expected: All that happened with this agreement is the formalisation of an informal negotiation structure, and the

organisation responsible for facilitating the work, FEDICT, did not have a sufficient budget to work on the topic [87].

These agreements and the related coordination show that there exists only a weak form of cooperation between the four actors. Each actor has its own working procedures. The Flemish Region started to develop its geospatial data and e-services governance structure much earlier than the other regions or the federal level, and has taken a different and more hierarchical approach. The Brussels Capital Region also has a long history of making the connection between geospatial data and information technology via the BRIC. The Brussels Region is characterised by a strong hierarchy, which was influenced to a high extent by the transposition of the INSPIRE Directive and the creation of a stronger network governance with the GeoBru Committee. The Walloon and the federal administrations, however, have struggled much longer with putting in place a governance structure for geospatial data and e-services: The Walloon Region has seemed to embark, although slowly, in the direction of network governance, whereas the federal administration still appears to have difficulties in making the connection between geospatial data and e-services—even after the transposition of the INSPIRE Directive.

4. Discussion

The fourth research question seeks to explain the current governance structures. From an intergovernmental perspective, a clear governance model is lacking. Also, the individual actors appear to struggle with developing such a governance model, whereby the Brussels Capital Region and the Flemish Region are the only two actors with a clear view on their governance of geospatial data and e-services. The Walloon Region has slowly started to develop a vision, but the federal administration has major difficulties with developing any sort of governance, as a result of which the crucial link between e-government and geospatial data seems to be lacking. This lack of an intergovernmental governance structure can be explained by taking a broader perspective: As various respondents said, there is a problem of awareness and information sharing. Organisations, and especially the people working in the organisations, do not know each other and do not know what the other is doing.

Furthermore, the three regions only work together when they see a clear need. As the regions have a clearly determined geospatial area for which they are responsible, they seem to be convinced of the fact that they can function on their own. This is highly problematic, as especially the federal level needs data of the regions, and delivers data to the regions. In some cases cooperation is necessary: Patrimonial information and address data are clear examples of this. The regions and the federal administration recognise the importance in the form of the so-called Cooperation Agreements. The impact of these agreements has, however, been limited.

Another point, especially important for the federal administration, is the lack of political support for geospatial e-services, leading to a lack of vision and strategy. Recently the e-government organisational structure has been reformed, but it remains to be seen what the effect will be. One of the respondents was rather sceptical of the new structure, as the administration responsible for the e-government strategy is hidden within the FPS Policy & Support, and considered it more a budgetary operation.

Finally, the federal administration and the regions (Flanders to a lesser extent) seem to be characterised by a strong organisational independence, leading to informal cooperation based on personal connections. An extra factor in the federal administration is the historical independence of the main organisations, which makes coordination more difficult. In the online survey respondents were asked whether, in the future, they were willing to collaborate more actively, both within the same governmental level and across different governmental levels. A scale ranging from "strongly disagree" to "strongly agree" was used. The results were, in light of the above, rather surprising as they show that there is a willingness to engage in future collaboration, both at the federal and regional level. Concerning collaboration within the same governmental level (Table 5), there was a large majority that supported future collaboration: 45 out of 67 federal respondents agreed or strongly agreed. For the

regional respondents the majority was slightly higher, with 48 out of 66 regional respondent agreeing or strongly agreeing.

Table 5. Willingness to engage in more active future collaboration within the same governmental level.

	Federal (Absolute Numbers—Total N: 67)	Federal (%)	Regional (Absolute Numbers—Total N: 66)	Regional (%)
Strongly disagree	0	0%	1	1.5%
Disagree	0	0%	0	0.0%
No agreement or disagreement	16	23.9%	11	16.7%
Agree	26	38.8%	28	42.4%
Strongly agree	19	28.4%	20	30.3%
No answer	6	9.0%	6	9.1%

Source: FLEXPUB research project [35].

Concerning future collaboration across different governmental levels (Table 6), a similar picture appeared. Both for the federal respondents and the regional respondents, the number of respondents who agreed and strongly agreed was high: 47 out of 67, and 48 out of 66 respondents, respectively. The regional level in Table 6 includes the three regions. Looking at the Flemish and Walloon Region in detail, however (the number of respondents from the Brussels Capital Region was only six, so this information is not useful for individual calculations at the regional level), shows that the respondents from the Walloon Region had a lower level of agreement than their Flemish counterparts. The number of respondents from the Flemish Region who agreed or strongly agreed was 21 out of 25 (84%); for the respondents from the Walloon Region that number was only 24 out of 36 (67%).

Table 6. Willingness to engage in more active future collaboration across different governmental levels.

	Federal (Absolute Numbers—Total N: 67)	Federal (%)	Regional (Absolute Numbers—Total N: 66)	Regional (%)
Strongly disagree	1	1.5%	1	1.5%
Disagree	1	1.5%	1	1.5%
No agreement or disagreement	15	22.4%	11	16,7%
Agree	27	40.3%	28	42.4%
Strongly agree	20	29.9%	20	30.3%
No answer	3	4.5%	5	7.6%

Source: FLEXPUB research project [35].

5. Conclusions

This article attempted to uncover what governance, and specifically what type of coordination, is used in the sector of geospatial data and e-services in Belgium. The theoretical coordination model (hierarchy, market and network) of Bouckaert et al. [23] was used to analyse the current situation, with a focus on the three regional administrations and the federal administration. Intergovernmental coordination was also analysed. The transposition of the INSPIRE Directive had a strong effect on the governance model of the administrations in the Walloon Region, the Brussels Capital Region and at the federal level. The Flemish Region is an exception as a clear governance model had already existed since the start of the 21st century, and can be labelled as a mixture of hierarchical and network governance. The Brussels Capital Region administration, and especially BRIC, is characterised by for its hierarchical working methods, although INSPIRE also led to the creation of network governance via the GeoBru Committee. In the Walloon administration cooperation has slowly started to develop, but progress towards a common strategy has been made. A form of network governance can be observed. Although the federal administration was influenced by the INSPIRE Directive, it is still struggling with the strong separation between geospatial data and e-services. From an intergovernmental perspective, a clear governance model between these four actors is lacking. Agreements between the regions and the federal level have been concluded, but the only effective agreement seems to be the one

on patrimonial information. The other agreements and related structures have resulted mainly in information-sharing groups.

Geospatial data are nevertheless exchanged between organisations within administrations and also between organisations of different administrations. The NGI and the FPS Finance play a key role in the more traditional types of geospatial data, whereas AIV takes a central position in sharing and exchanging almost all types of data between organisations. In the Walloon administration, however, there is no organisation that takes such a central position: Data exchange is much less centralised. The INSPIRE Directive has had a strong effect, as the transposition has led to governmental obligations to create geoportals. The transition to the development of geospatial e-services across different organisations, however, is still partially lacking at the federal and Walloon level, as the governance models of the Walloon Region and the federal administrations are still too immature. The administrations of the Brussels Capital Region and the Flemish Region have well-developed governance structures, however, and are thus able to develop and maintain well-functioning geospatial e-services.

The intergovernmental situation can be explained by the fact that there is a problem of awareness about what the other administrations and organisations within those administrations are doing. Furthermore, the three regions only work together when they see a clear need for this: There is a strong notion among the regions that they can function separately, without coordinating their policies. Particularly important at the federal level is the lack of political support for geospatial e-services and data, as it has led to a lack of vision and strategy. Finally, the federal administration seems to be characterised by strong organisational independence.

While this article is a first attempt at understanding the governance structures for geospatial data and e-services in Belgium, more research is nevertheless required concerning the specificities of the different Belgian regions and the federal administration in developing geospatial e-services.

Although Belgium was selected as a case study because of its complex dual federal structure, the authors believe that the research methodology could be useful for analysing the governance structure of geospatial e-services and data in other countries. This would allow for a comparison between countries. There are various possible case studies, three of which are presented hereafter. The first possibility is Spain. Being "one of the most decentralised countries in Europe", it has redistributed the administrative and political power among the central government and the autonomous authorities [88]. Although two main differences with regard to Belgium can immediately be identified—Spain has more autonomous authorities than Belgium; and the competences assigned to the Belgian regions are equal, while this is not the case in Spain—it could be useful to undertake a similar analysis of the Spanish system by making use of the methodology applied in this paper. This would be particularly relevant since a recently published UN study on good practices of geospatial governance shows that the Spanish National Geographic Institute developed partnerships with organisations within the same administration, as well as with autonomous authorities for the establishment of a National Plan for Land Observation [89].

Germany might also be an interesting case to study. It is a federal state, with a federal administration, autonomous regions—the Länder—and communities. From an e-government perspective, Germany seems to have difficulties in providing e-services to its users, as one of the main challenges is the mismatch between administrations. E-service initiatives are taken by the federal administration, whereas users often tend to use services at local level [90,91]. From a geospatial perspective, however, there seems to be cooperation that is stimulated by the INSPIRE Directive. The federal administration, the autonomous regions and the associations of communities are working together on the Geospatial Data Infrastructure Germany [92].

Finally, the authors believe that not only federal or decentralised countries could be studied with this methodology. Cooperation can also be difficult in more centralised states, as organisations within the same administration have direct hierarchical power over various actors at lower levels. This, however, requires coordination among both the hierarchically equal organisations at the higher

level and between the organisations on the lower administrative levels [93]. The French governance of geospatial e-services and data might in this respect be a useful case study. It is also influenced by EU legislation, such as the INSPIRE Directive, and different lessons might be learned from a governance perspective.

The countries described above are only examples that aim to show that the methodology applied for this paper might also be relevant for studying other countries. Not only federalised and decentralised countries face coordination difficulties; centralised countries are also confronted with similar challenges. Further research is therefore required to help improve knowledge about different governance structures—which is not only useful for academic purposes but also for policy makers.

Supplementary Materials: The following are available online at www.mdpi.com/2220-9964/6/9/282/s1. Reports of the conducted interviews and data of Table 4.

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